IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Mostafazadeh et al.

Application No.: 10/044,162

Filed: January 11, 2002

Title: PLASTIC PACKAGE WITH EXPOSED DIE AND METHOD OF MAKING SAME

Attorney Docket No.: NSC1P225R/P03405D1-R1

Examiner: Pham, T.

Group: 2823

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this correspondence is being transmitted by facsimile to fax number (571) 273-8300 to the U.S. Patent and Trademark Office on March 31, 2006.

Signed: Lara M. Nelson

Lara M. Nelson

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This appeal is from the Final Office Action dated January 31st, 2006. In that Office Action, all of the pending claims were rejected on the basis of a combination of three references. That is, Ogawa (U.S. Patent No. 5,252,855) in combination with Melton (U.S. Patent No. 5,844,315) and Djennas (U.S. Patent No. 5,474,958). The Final Office Action set forth a new grounds of rejection and therefore the rejections set for in the preceding Office Actions are not discussed herein.

A request for reconsideration was fax filed on February 14th, 2006. The conferees are respectfully directed to that response which is believed to explain in detail why the outstanding rejection is improper and should be withdrawn. The currently pending claims are presented in the same paper. It is noted that this is a reissue application and therefore the claims are presented in that response in the format that is required for reissue applications.

The Present Invention

The present invention relates to lead frame based methods of packaging integrated circuits. More particularly, the lead frame and a die are mounted on an adhesive tape. (See, e.g. Fig. 5). After electrically connecting the die to the lead frame, a plastic casing is formed over the die and lead frame. (See, e.g., Fig. 6). The tape prevents the plastic casing (e.g. molding)

material from flowing beneath the lead frame. After the casing has been formed, the tape may be removed. With this arrangement, the bottom surface of the lead frame (which was attached to the adhesive tape) remains exposed at the bottom surface of the package and **the exposed leads form the electrical contacts** (indeed the only electrical contacts) for the package.

As currently presented independent claim 1 requires, inter alia:[1]

> mounting the lead frame and an integrated circuit die onto a strip of adhesive tape such that a lower surface of the die contacts the adhesive tape and the die is located in the central opening, and the lower surface of the lead frame also contacts the adhesive tape;
>
> * * *
>
> forming a plastic casing over an upper surface of the die and the upper surface of the lead frame wherein the plastic casing comes into contact with the adhesive tape **such that a lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die**; and
>
> **removing the adhesive tape after forming the plastic casing to expose the lower surfaces of the die and the lead frame, whereby exposed portions of the lead frame form the only externally accessible I/O contacts for the package and plastic material fills at least portions of gaps between adjacent leads, such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die.**

The Ogawa Reference

The outstanding rejection utilizes Ogawa as the primary reference. Ogawa is directed at the fabrication of a lead frame having a support member (2, 8) that is secured to the bottom surface of the lead frame 1. The support member serves as a support for the die 4 both during assembly and **when the lead frame is eventually used in a package**. In the embodiment illustrated in Figs. 1 and 3, the support member is a resin film or plate 2 (e.g. polyimide). In the embodiment illustrated in Fig. 4, the support is a metal plate 8. In either event, as would be readily appreciated by anyone of ordinary skill in the art, the support member (resin film) is intended to be integrated into the package. This type of die support structure was well known at the time of Ogawa and such supporting structures were normally fully encased by the plastic molding material in the finalized package.

The Outstanding Rejection

The outstanding office action acknowledges that Ogawa does not disclose the step of forming a plastic casing over the die and lead frame in a manner that leaves the lower surface of

[1] Independent Claim 7 requires similar steps although the relevant wording of the claim varies somewhat.

the lead frame exposed and substantially coplanar with the lower surface of the plastic casing. The office action then relies on Melton for the propositions that it would be obvious to modify Ogawa to: (a) form a plastic casing over the lead frame in a manner that leaves the bottom surface of the lead frame exposed; and (b) remove the resin film 2 taught by Ogawa.

It is respectfully submitted that those skilled in the art at the time of the present invention would **not** have been motivated by any reasonable combination of the Ogawa and Melton references to make the combination proposed by the outstanding rejection (or the specific combinations set forth in independent claims 1 and 7). As has been argued extensively in earlier responses, the resin member 2 disclosed by Ogawa is very clearly intended to be a **permanent** structure and its removal would completely defeat the purpose of Ogawa reference. It is well settled that in order to support a prima facie case of obviousness, there must be some suggestion or motivation (either in the references themselves or in the knowledge generally available to one of ordinary skill in the art) to modify a reference or to combine the teaching of two (or more) references. See, MPEP §2143. It is also well established that if a proposed modification would render the prior art being modified unsatisfactory for its intended purpose, then, as a matter of law, there can **not** be a suggestion or motivation to make the proposed modification. MPEP §2143.01(v). In view of the fact that removing the resin member would completely defeat the purpose of Ogawa, it is respectfully submitted that nothing in Melton would motivate those skilled in the art to make the combination asserted in the outstanding rejection. Accordingly, it is respectfully submitted that a prima facie case of obviousness has not been made and that the outstanding rejections should be withdrawn for at least this reason.

In the advisory action dated March 1, 2006, the Examiner appeared to acknowledge that Ogawa himself contemplated permanently adhering the resin film 2 to the bottom surface of the lead frame. However the Advisory Action states that the rejection is not based on Ogawa's invention, but rather on Ogawa's characterization of the prior art. Specifically, the Advisory Action cites Col. 2. lines 20-21 of Ogawa which when describing the prior art states: "The adhesive force between the resin type adhesive agent and these metal material is not necessarily sufficient." The Advisory Action then appears to jump to the conclusion that this passage suggests that the resin film 2 may be "peeled off in the next step beyond Ogawa." See Page 2 of the Advisory Action. However, such step is clearly contrary to the teaching of Ogawa which even when discussing the prior art clearly contemplates that the resin film 2 would be a permanent structure. This can be clearly seen by reading the entire paragraph from which the above quote was taken out of context. Specifically, the paragraph that begins at Col. 2, line 15 of Ogawa reads:

> As mentioned above, the conventional lead frame is of such a construction that the resin film 2 is directly joined with the inner lead 1 made of a copper alloy

> or an iron alloy by means of the resin type adhesive 3. In general, however, the adhesive force between the resin type adhesive agent and these metal materials is not necessarily sufficient. On account of this, it is appreciated that, due to shear stress to be exerted at the time of bending work of the lead during the assembling step of the semiconductor package, or thermal stress to be applied under various heating environments, or else, adhesiveness at the above-mentioned adhesive interface becomes decreased to bring about very fine gaps between them. In such case, when moisture-adsorption takes place in the package, water is condensed in these small gaps, and this condensed water, when heated again, becomes vaporized to expand its volume to lead to a possible danger of bringing about cracks in the semiconductor package. Therefore, improvement in the adhesive force between the resin member and the metal member is of paramount importance **on the operational reliability of the semiconductor package.** (*emphasis added*).

It is submitted that this passage makes it clear that Ogawa contemplated that the resin member 2 was to be permanently attached to the lead frame and incorporated into the package in both his own invention and in the prior art to which he was referring. Accordingly, as previously expressed, it is respectfully submitted that removing the resin film would completely defeat the purpose of the Ogawa reference.

The outstanding rejection correctly points out that Melton describes adhering an adhesive tape to the back side of a lead frame and removing the adhesive tape after a plastic casing has been formed. However the **claim language specifically requires that the lead frame be exposed on the lower surface of the package and that such exposed portions of the lead frame form the only externally accessible I/O contacts for the package.** Specifically, Claim 1 requires:[2]

> removing the adhesive tape after forming the plastic casing to expose the lower surfaces of the die and the lead frame, whereby exposed portions of the lead frame form the only externally accessible I/O contacts for the package and plastic material fills at least portions of gaps between adjacent leads, such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die.

The outstanding rejection acknowledges that Ogawa does not disclose such a step or structure and that Melton does not disclose such a step or structure. Indeed none of the prior art of record

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[2] Independent Claim 7 requires similar steps although the relevant wording of the claim varies somewhat. Specifically, claim 7 requires:

> removing the adhesive tape after molding the plastic casing to expose the lower surfaces of the die and the leads, whereby exposed portions of the leads form the only externally accessible I/O contacts for a resulting integrated circuit package and plastic material fills at least portions of gaps formed between adjacent leads such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die.

suggests such a step or structure. Rather, the outstanding rejection is based on the premise that one of ordinary skill in the art would be motivated by Melton to remove the resin film 2 from the lead frame AFTER the package has been formed to thereby leave the lower surface of the lead frame exposed in a manner that the exposed bottom surfaces of the lead frame can be used as the only externally accessible I/O contacts. It is respectfully submitted that such a combination is unrealistic in part because it would defeat the purpose of the Ogawa reference (or the prior art described in the Ogawa reference) as previously described.[3]

The Other Claims

The language of independent claim 7 varies somewhat from the language of independent claim 1 discussed above. However, the arguments made above are equally applicable to independent claim 7 and the dependent claims. These claims are further discussed in the request for reconsideration was fax filed on February 14th, 2006. The conferees are respectfully directed to that response which is believed to explain in detail why the outstanding rejection is improper and should be withdrawn.

Conclusion

In view of the foregoing, it is respectfully submitted that all pending claims are patentable over the art of record and that outstanding rejections should be withdrawn. Should the conferees have any questions or concerns regarding the present application, they are encouraged to contact the undersigned at the telephone number set out below.

Respectfully submitted,
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[3] It is appreciated that the Examiner is not relying on the invention disclosed by Ogawa in the rejection but rather the prior art discussed in Ogawa. Nevertheless, it is noted that the entire intent of the Ogawa reference was to put an anodic oxide film on the lead frame in order to improve the adhesion of the adhesive to the leadframe. See, e.g., the paragraph beginning at Col. 3, line 65 of Ogawa. It is the undersigned understanding that putting an oxide film on the exposed surface of a copper lead frame significantly reduces its conductivity. This, of course, would be highly undesirable if one were to try to use that portion of the lead from as an external contact. Thus, it seems ironic that the primary reference being used in the outstanding rejection teaches a process that would presumably make the lead frame unsuitable for use in the type of package that is being formed by the claimed process (unless of course the oxide film is removed in the regions that are intended for use as external contacts.